OPERATING INSTRUCTIONS AND SPECIFICATIONS
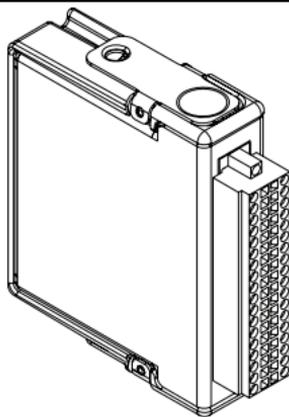
NI 9264

16-Channel, ±10 V, 16-Bit Analog Voltage Output Module

Français Deutsch 日本語 한국어 简体中文
ni.com/manuals

This document describes how to use the National Instruments 9264 and includes specifications and terminal assignments for the NI 9264. Visit ni.com/info and enter `rdsoftwareversion` to determine which software you need for the modules you are using. For information about installing, configuring, and programming the system, refer to the system documentation. Visit ni.com/info and enter `cseriesdoc` for information about C Series documentation.

> **Note** The safety guidelines and specifications in this document are specific to the NI 9264. The other components in the system might not meet the same safety ratings and specifications. Refer to the documentation for each component in the system to determine the safety ratings and specifications for the entire system. Visit ni.com/info and enter `cseriesdoc` for information about C Series documentation.

Safety Guidelines

Operate the NI 9264 only as described in these operating instructions.

⚠ **Hot Surface**   This icon denotes that the component may be hot. Touching this component may result in bodily injury.

Safety Guidelines for Hazardous Voltages

If hazardous voltages are connected to the module, take the following precautions. A hazardous voltage is a voltage greater than 42.4 V_{pk} or 60 VDC to earth ground.

⚠ **Caution**   Ensure that hazardous voltage wiring is performed only by qualified personnel adhering to local electrical standards.

⚠ **Caution**   Do *not* mix hazardous voltage circuits and human-accessible circuits on the same module.

⚠ **Caution**   Make sure that devices and circuits connected to the module are properly insulated from human contact.

⚠️ **Caution** When module terminals are hazardous voltage LIVE (>42.4 V_{pk}/60 VDC), you must ensure that devices and circuits connected to the module are properly insulated from human contact. You must use the NI 9940 connector backshell kit to ensure that the terminals are *not* accessible.
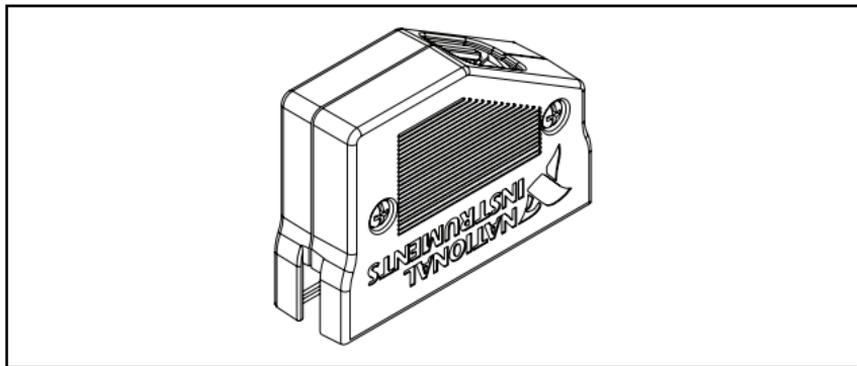
Figure 1 shows the NI 9940 connector backshell.

Figure 1. NI 9940 Connector Backshell

Safety Guidelines for Hazardous Locations

The NI 9264 is suitable for use in Class I, Division 2, Groups A, B, C, D, T4 hazardous locations; Class I, Zone 2, AEx nA IIC T4, and

Ex nA IIC T4 hazardous locations; and nonhazardous locations only. Follow these guidelines if you are installing the NI 9264 in a potentially explosive environment. Not following these guidelines may result in serious injury or death.

⚠ **Caution** Do *not* disconnect I/O-side wires or connectors unless power has been switched off or the area is known to be nonhazardous.

⚠ **Caution** Do *not* remove modules unless power has been switched off or the area is known to be nonhazardous.

⚠ **Caution** Substitution of components may impair suitability for Class I, Division 2.

⚠ **Caution** For Zone 2 applications, install the system in an enclosure rated to at least IP 54 as defined by IEC 60529 and EN 60529.

⚠ **Caution** For Zone 2 applications, connected signals must be within the following limit:

Capacitance ....0.2 µF max

Special Conditions for Hazardous Locations Use in Europe

This equipment has been evaluated as Ex nA IIC T4 equipment under DEMKO Certificate No. 07 ATEX 0626664X. Each module is marked ⟨Ex⟩ II 3G and is suitable for use in Zone 2 hazardous locations. If you are using the NI 9264 in Gas Group IIC hazardous locations or in ambient temperatures of $-40\ °C \leq Ta \leq 70\ °C$, you must use the device in an NI chassis that has been evaluated as EEx nC IIC T4, Ex nA IIC T4, or Ex nL IIC T4 equipment.

Special Conditions for Marine Applications

Some modules are Lloyd's Register (LR) Type Approved for marine applications. To verify Lloyd's Register certification, visit ni.com/certification and search for the LR certificate, or look for the Lloyd's Register mark on the module.

⚠️ **Caution** To meet radio frequency emission requirements for marine applications, use shielded cables and install the system in a metal enclosure. Suppression ferrites must be installed on power supply inputs near power entries to modules and controllers. Power supply and module cables must be separated on opposite sides of the enclosure and must enter and exit through opposing enclosure walls.

Connecting the NI 9264

The NI 9264 has a 36-terminal detachable spring-terminal connector that provides connections for 16 analog output channels.
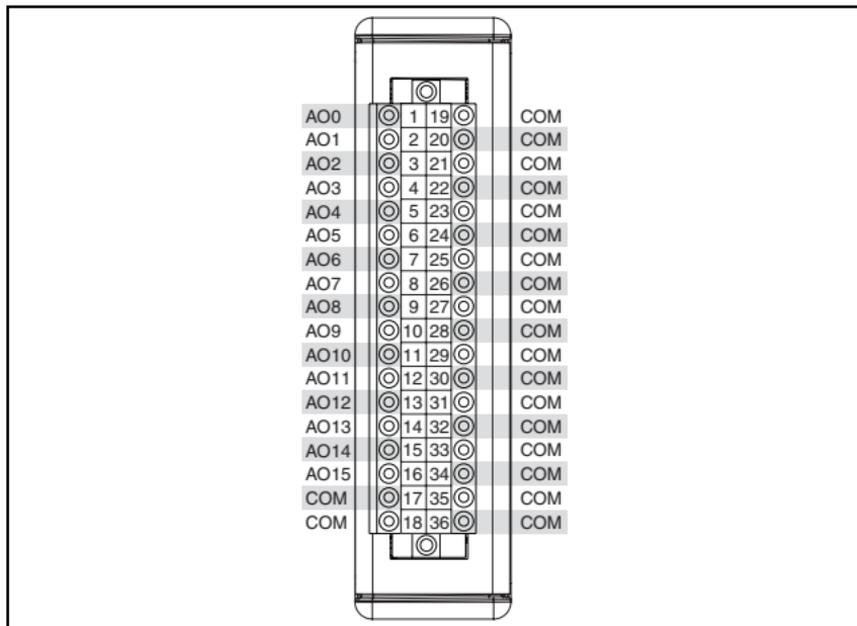

Figure 2. NI 9264 Terminal Assignments

Each channel of the NI 9264 has a terminal to which you can connect the positive lead of a load. Each channel also has a common terminal, COM, and there are four additional COM terminals at the bottom of the connector. All of the COM terminals are internally connected to the isolated ground reference of the module. When connecting a load to the NI 9264, connect the positive lead of the load to the AO terminal, and the ground of the load to a COM terminal. Refer to Figure 3 for an illustration of connecting a load to the NI 9264.
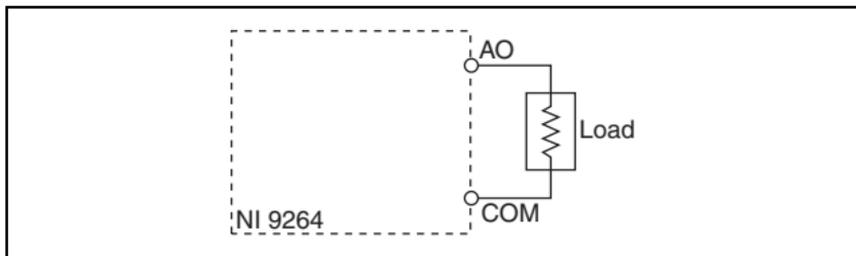

Figure 3. Connecting a Load to the NI 9264

Each channel has a digital-to-analog converter (DAC) that produces a voltage signal. Each channel also has overvoltage and short-circuit protection. Refer to the *Specifications* section for more information about overvoltage and short-circuit

protection. Refer to Figure 4 for an illustration of the output circuitry for one channel of the NI 9264.
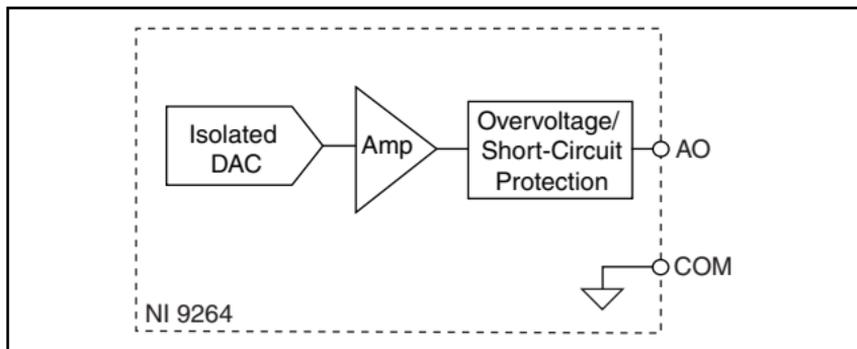

Figure 4. Output Circuitry for One Channel of the NI 9264

When the module powers on, the channels output the startup voltage. Refer to the *Specifications* section for more information about startup voltage. Refer to the software help for information about configuring startup output states in software.

Connecting Wires to the NI 9264 Connector

Use a flathead screwdriver with a blade smaller than 2.3×1.0 mm $(0.09 \times 0.04$ in.) to connect wires to the detachable spring-terminal connector. Insert the screwdriver into a spring clamp activation slot and press a wire into the corresponding connector terminal, then remove the screwdriver to clamp the wire into the terminal. Refer to the *Specifications* section for more information about spring-terminal wiring. Refer to Figure 5 for an illustration of connecting wires to the NI 9264.
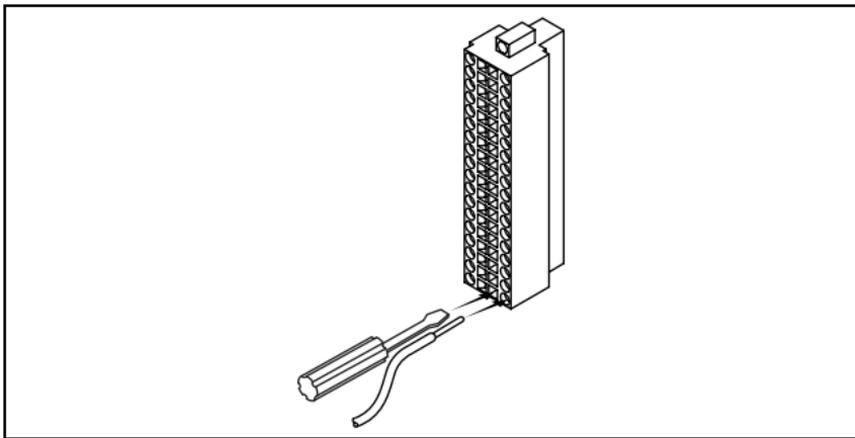

Figure 5. Connecting Wires to the NI 9264 Connector

Wiring for High-Vibration Applications

If an application is subject to high vibration, National Instruments recommends that you use the NI 9940 backshell kit to protect the connections. Refer to Figure 1 for an illustration of the NI 9940 connector backshell.

Sleep Mode

This module supports a low-power sleep mode. Support for sleep mode at the system level depends on the chassis that the module is plugged into. Refer to the chassis manual for information about support for sleep mode. If the chassis supports sleep mode, refer to the software help for information about enabling sleep mode. Visit ni.com/info and enter cseriesdoc for information about C Series documentation.

Typically, when a system is in sleep mode, you cannot communicate with the modules. In sleep mode, the system consumes minimal power and may dissipate less heat than it does in normal mode. Refer to the *Specifications* section for more information about power consumption and thermal dissipation.

Specifications

The following specifications are typical for the range –40 to 70 °C unless otherwise noted. All voltages are relative to COM unless otherwise noted.

Output Characteristics

Number of channels .... 16 analog output channels

DAC resolution .... 16 bits

Type of DAC .... String

Output range

    Minimum .... ±10.35 V

    Typical .... ±10.5 V

    Maximum .... ±10.65 V

Current drive .... ±16 mA all channels max;
    ±4 mA per channel typ

Power-on output state .... Channels off

Startup voltage .... 0 V[1]

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[1] When the module powers on, a glitch occurs for 20 µs peaking at 500 mV.

Power-down voltage .... 0 V[1]

Output impedance .... 2.0 Ω

Accuracy

Measurement Conditions	Percent of Reading (Gain Error)	Percent of Range* (Offset Error)
Calibrated, max (−40 to 70 °C)	0.15%	0.15%
Calibrated, typ (25 °C)	0.05%	0.05%
Uncalibrated, max (−40 to 70 °C)	0.6%	1.0%
Uncalibrated, typ (25 °C)	0.2%	0.25%
* Range equals 10.5 V		

Stability

    Gain drift .... 6 ppm/°C

    Offset drift .... 80 µV/°C

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[1] The power-down voltage peaks at 1.7 V, then exponentially discharges to 0 V in 200 ms. You can add a load to reduce peak voltage.

Protection

    Overvoltage .... ±27 V at 25 °C

    Short-circuit .... Indefinitely

Update time

Number of Channels	Update Time for cRIO-9151 R Series Expansion Chassis	Update Time for All Other Chassis
1	3.7 µs min	3.1 µs min
2	6.6 µs min	5.3 µs min
3	9.4 µs min	7.5 µs min
16	47 µs min	37 µs min

Noise .... 500 μV_{rms}

Crosstalk .... 90 dB

Settling time (100 pF load, to 1 LSB)

    20 V step .... 20 µs

    1 V step .... 15 µs

    0.1 V step .... 13 µs

Capacitive drive .... 1,500 pF max

Monotonicity.................................... 16 bits

DNL .... +1 LSB max

INL (endpoint) .... ±12 LSBs max

MTBF .... 595,509 hours at 25 °C;
Bellcore Issue 2, Method 1,
Case 3, Limited Part Stress
Method

Note Contact NI for Bellcore MTBF specifications at other temperatures or for MIL-HDBK-217F specifications.

Power Requirements

Power consumption from chassis

    Active mode .... 1 W max

    Sleep mode .... 25 µW max

Thermal dissipation (at 70 °C)

    Active mode .... 1 W max

    Sleep mode .... 25 µW max

Physical Characteristics

If you need to clean the module, wipe it with a dry towel.

Spring-terminal wiring......................18 to 28 AWG copper
conductor wire with 7 mm
(0.28 in.) of insulation
stripped from the end

Weight...156 g (5.5 oz)

Safety

Isolation Voltages

Channel-to-channel...........................None

Channel-to-earth ground

    Continuous ....250 V_{rms},
Measurement Category II

    Withstand...................................2,300 V_{rms}, verified by a 5 s
dielectric withstand test

Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet, for example, 115 V for U.S. or 230 V for Europe.

⚠ **Caution** Do *not* connect the NI 9264 to signals or use for measurements within Measurement Categories III or IV.

Safety Standards

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

📝 **Note** For UL and other safety certifications, refer to the product label or visit ni.com/certification, search by module number or product line, and click the appropriate link in the Certification column.

Hazardous Locations

U.S. (UL) .... Class I, Division 2,
Groups A, B, C, D, T4;
Class I, Zone 2,
AEx nA IIC T4

Canada (C-UL) .... Class I, Division 2,
Groups A, B, C, D, T4;
Class I, Zone 2,
Ex nA IIC T4

Europe (DEMKO)............................. Ex nA IIC T4

Environmental

National Instruments C Series modules are intended for indoor use
only but may be used outdoors if installed in a suitable enclosure.
Refer to the manual for the chassis you are using for more
information about meeting these specifications.

Operating temperature
(IEC 60068-2-1, IEC 60068-2-2) ..... −40 to 70 °C

Storage temperature
(IEC 60068-2-1, IEC 60068-2-2) ..... −40 to 85 °C

Ingress protection.............................. IP 40

Operating humidity
(IEC 60068-2-56)..............................10 to 90% RH,
noncondensing

Storage humidity
(IEC 60068-2-56)..............................5 to 95% RH,
noncondensing

Maximum altitude.............................2,000 m

Pollution Degree (IEC 60664) 2

Shock and Vibration

To meet these specifications, you must panel mount the system and
use the NI 9940 backshell kit to protect the connections.

Operating vibration

Random (IEC 60068-2-64).........5 g_{rms}, 10 to 500 Hz

Sinusoidal (IEC 60068-2-6) ....5 g, 10 to 500 Hz

Operating shock
(IEC 60068-2-27)..............................30 g, 11 ms half sine,
50 g, 3 ms half sine,
18 shocks at 6 orientations

Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 EMC requirements; Industrial Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

Note For EMC compliance, operate this device with shielded cabling.

CE Compliance

This product meets the essential requirements of applicable European directives, as amended for CE markings, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit ni.com/certification, search by module number or product line, and click the appropriate link in the Certification column.

Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at ni.com/environment. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit ni.com/environment/weee.htm.

电子信息产品污染控制管理办法 （中国 RoHS）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 ni.com/environment/rohs_china。(For information about China RoHS compliance, go to ni.com/environment/rohs_china.)

Calibration

You can obtain the calibration certificate and information about calibration services for the NI 9264 at ni.com/calibration.

Calibration interval .... 1 year

Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At ni.com/support you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at ni.com/support and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 662 457990-0,
Belgium 32 (0) 2 757 0020, Brazil 55 11 3262 3599,
Canada 800 433 3488, China 86 21 5050 9800,
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,
Finland 358 (0) 9 725 72511, France 01 57 66 24 24,
Germany 49 89 7413130, India 91 80 41190000,
Israel 972 3 6393737, Italy 39 02 41309277, Japan 0120-527196,

Korea 82 02 3451 3400, Lebanon 961 (0) 1 33 28 28,
Malaysia 1800 887710, Mexico 01 800 010 0793,
Netherlands 31 (0) 348 433 466, New Zealand 0800 553 322,
Norway 47 (0) 66 90 76 60, Poland 48 22 3390150,
Portugal 351 210 311 210, Russia 7 495 783 6851,
Singapore 1800 226 5886, Slovenia 386 3 425 42 00,
South Africa 27 0 11 805 8197, Spain 34 91 640 0085,
Sweden 46 (0) 8 587 895 00, Switzerland 41 56 2005151,
Taiwan 886 02 2377 2222, Thailand 662 278 6777,
Turkey 90 212 279 3031, United Kingdom 44 (0) 1635 523545